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TECHNOLOGY

Cardiac catheterisation with 5 French catheters

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Abstract

From the beginning of November 1987 to the end of January 1989, 526 coronary arteriograms and left ventricular angiograms were performed with 5 French coronary catheters. In 448 (85%) patients diagnostic pictures were obtained with three standard types of 5 French catheters (No 4 Judkins): that is, left coronary, right coronary, and pigtail catheters. In 60 patients (11·4%) various other 5 French catheters were required to complete the study. In nine patients (1·7%), a 7 or 8 French catheter was used. Major complications causing cardiac arrest or requiring urgent operation developed in five patients. Sixty two patients (11·77%) had minor complications that required sublingual nitrates or a single bolus of atropine, or developed a haematoma that did not need intervention or had a mild reaction to the contrast material. Complications of moderate severity developed in 17 patients (3·2%): severe chest pain, arrhythmia requiring a temporary pacemaker, contrast reaction associated with hypotension, haematoma requiring blood transfusion, or a transient ischaemic episode. There were no deaths.

5 French catheters were used for routine coronary angiography and left ventriculography in 98·3% of patients. There were no major complications related to femoral artery puncture. The routine use of 5 French coronary catheters should increase the feasibility of safe coronary angiography in outpatients and should reduce the cost of this investigation.

Diagnostic coronary arteriography is recognised as being a safe procedure in experienced hands, with a complication rate of approximately 1%.[1,2] Coronary catheters are generally available in either 7 or 8 French sizes. Improvement in catheter design now allows rapid contrast delivery through 5 French catheters. The chief advantage of using these smaller catheters is that they cause less injury at the site of vascular access. Some operators, however, believe that adequate diagnostic information will not be obtained with 5 French catheters. We report on a large series of diagnostic coronary arteriograms obtained with 5 French catheters in which we found out how often coronary arteriography could be satisfactorily completed with 5 French catheters alone.

Patients and methods

METHODS

We examined the records of cardiac catheterisation in all patients who underwent coronary arteriography from November 1987 to the end of January 1989. We noted all the coronary catheters used to complete the examination, all drugs given during the examination, and any complication that developed in the catheterisation laboratory or in the observation ward where the patients are routinely kept for six hours. During the study period we attempted all examinations with 5 French catheters and used other catheters only if the coronary arteries could not be selectively cannulated or if an adequate image could not be obtained.

A 5 French sheath was inserted into the femoral artery under local anaesthesia and the coronary catheters introduced over a guide wire. We used three standard 5 French catheters: a left coronary catheter (Judkins 4), a right coronary catheter (Judkins 4), and pigtail catheters. The contrast material was Ultravist 370. For left ventricular angiography we injected 30–35 ml of contrast material at 10–15 ml/s. We used biplane angiographic equipment (General Electric CGR) with conventional radiography in all cases. Heparin was not routinely given. All angiograms were performed by consultant cardiologists.

Results

Five hundred and twenty six patients underwent diagnostic coronary arteriography over this 15 month period. Thirty one patients had right and left heart studies. Four patients with suspected severe aortic stenosis were studied by the Sones technique and are not included in this report. All other patients had known or suspected coronary artery disease. Thirty five per cent of patients were studied as outpatients. The mean age of the study group was 55·4 years and 64·4% were men. In five (0·9%) cases the left femoral artery was used because the guide wire could not be advanced from the right side. The right coronary artery was not selectively entered in two patients. Left ventricular angiography was not performed in 17 patients. A satisfactory left ventricular end diastolic pressure recording was obtained in over 95% of patients. Seven of the patients studied had coronary artery bypass grafts.

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Table 1 Additional coronary catheters used in 78 patients

Type		No
8 French left coronary catheter	(Judkins 6)	1
8 French left coronary catheter	(Judkins 5)	3
8 French left coronary catheter	(Judkins 4)	2
7 French left coronary catheter	(Judkins 6)	1
7 French left coronary catheter	(Judkins 5)	1
7 French left coronary catheter	(Judkins 4)	1
8 French right coronary catheter	(Judkins 5)	1
8 French right coronary catheter	(Judkins 4)	5
7 French right coronary catheter	(Judkins 4)	3
8 French pigtail catheter		4
7 French pigtail catheter		3
5 French left coronary catheter	(Judkins 5)	36
5 French left coronary catheter	(Judkins 3·5)	4
5 French right coronary catheter	(Judkins 5)	5
5 French right coronary catheter	(Judkins 3·5)	11
5 French internal mammary catheter		18
5 French multipurpose catheter		14
Total		113

In 448 patients (85%) the study was completed with the three standard 5 French catheters. In a further 60 patients (11·4%) the study was completed with a single additional 5 French catheter. Eighteen patients (3·4%) required more than four different coronary catheters to complete the study and in five of these a bypass graft was being studied. In only nine (1·7%) patients were 7 or 8 French catheters required. Coronary artery imaging was satisfactory in 517 (98·2%) patients with a combination of different 5 French catheters. Table 1 outlines the different catheters used in the 78 (14·8%) patients in whom more than the three standard catheters were used.

Table 2 outlines the complications noted during the procedure and up to six hours later. Sixty two patients (11·77%) had minor complications. There were moderately severe complications in 17 patients (3·2%); patients who had a pacemaker inserted for the duration of the procedure were included in this group. No patient required pacing after the procedure was completed. There were major complications in five (0·95%) patients (two patients who required urgent cardioversion went on to immediate coronary artery bypass grafting). There were no deaths in our series. Overall, 22 patients (4·1%) suffered moderate or severe complications. The screening time was recorded in a group of 50 consecutive cases and the mean screening time was 3·01 minutes (range 2·25 to 8·0).

Discussion

The complication rate of coronary arteriography performed as a diagnostic procedure is low.[1] The incidence of major complications reported from two major studies was $<1\%$.[2,3] Wyman and colleagues reviewed the complication rate of inpatient diagnostic cardiac catheterisations and reported local vascular complications in 4%; 1·6% required operative repair.[4] Some centres are now performing coronary arteriography as a day case procedure and one might expect that earlier mobilisation would increase the risk of local vascular complications. Block *et al* recently published the results of a prospective comparison of outpatient and inpatient cardiac catheterisation with 7 or 8 French coronary catheters.[5] They found a haematoma in 12% of the outpatients compared with 8·5% of the inpatients, a difference that did not achieve statistical significance. In a more recent retrospective review of outpatient cardiac catheterisation with 7 or 8 French catheters local vascular complications were seen in 1·1% of patients up to six hours after the procedure.[6] Cardiac catheterisation with the smaller 5 French catheters should cause less damage of the femoral artery; but there is some concern about the technical aspects of their use[7,8] and the quality of the radiographic images obtained.

In our experience 5 French catheters are satisfactory in terms of technical manipulation and quality of the radiographic images. In over 500 patients we had to change to 7 or 8 French catheters in only 1·7% of patients. In nearly all of them (98·3%) coronary arteriography and left ventriculography could be completed with a combination of 5 French catheters. We found that in patients with moderately stenosed aortic valves we often needed to cross the valve with a guide wire initially. We did not encounter any particular problems with selective cannulation of the right coronary artery as some have reported.[7] We did, however, occasionally need to change to a multipurpose or internal mammary catheter to cannulate the right coronary artery. Our overall complication rate was low with no deaths and less than 1% of patients developing severe complications.

We found that the frequency of haematoma was low in the first six hours after the

Table 2 Complications (number of patients; (% of total)) occurring during and immediately (<6 h) after cardiac catheterisations

Complications	Mild	Moderate	Severe
Ischaemic	Chest pain or ST segment elevation which resolved with sublingual nitrates, calcium antagonists (40 (7·6%))	Chest pain requiring a nitrate infusion or intravenous morphine (5 (0·9%))	Myocardial infarction or urgent CABG/PTCA (4 (0·7%))
Arrhythmic	Single bolus of atropine (0·6 mg) (18 (3·4%))	Antiarrhythmic agent given or temporary pacemaker (6 (1·1%))	Cardioversion and cardiac arrest (3 (0·57%))
Vascular	Haematoma not requiring transfusion (3 (0·57%))	Transfusion required (2 (0·38%))	Surgical repair (0 (0%))
Allergic	Rash (1 (0·2%))	Hypotension (1 (0·2%))	Anaphylaxis (0 (0%))
Embolic		Transient ischaemic event (3 (0·57%))	Systemic embolus (0 (0%))

CABG, coronary artery bypass grafting; PTCA, percutaneous transluminal coronary angioplasty.

procedure. We do not have a control group for comparison but the frequency of haematoma was low compared with that reported in other outpatient and inpatient studies.[1 5 9] In Block *et al*'s study bleeding or haematoma formation in the groin were the main reasons that patients scheduled for outpatient cardiac catheterisation were admitted to hospital.[5]

We report our experience when we used primarily 5 French coronary catheters in a large number of patients. Our results suggest that such catheters can be routinely used for diagnostic cardiac catheterisation. By using these catheters we are now examining over 30% of our patients as day-care cases. The routine use of these smaller catheters should result in fewer local vascular complications and this is a great advantage for outpatient cardiac catheterisation.

1 Abrams HL, Adams DF. The complications of coronary arteriography. *Circulation* 1975;**52**:11–27.
2 Davis K, Kennedy JW, Kemp HG, Judkins MP, Gosselin AS, Killip T. Complications of coronary arteriography from the collaborative study of coronary artery surgery. *Circulation* 1979;**59**:1105–11.
3 Kennedy JW. Complications associated with cardiac catheterization and angiography. *Cathet Cardiovasc Diagn* 1982;**8**:5–11.
4 Wyman MR, Safian RD, Portway V, Silkman JJ, McKay RG, Baim D. Current complications of diagnostic and therapeutic cardiac catheterization. *J Am Coll Cardiol* 1988;**12**:1400–6.
5 Block PC, Ockene I, Goldberg RJ, *et al*. A prospective randomised trial of out-patient versus in-patient cardiac catheterization. *N Engl J Med* 1988;**319**:1251–5.
6 Oldroyd KG, Phadke KU, Philips R, *et al*. Cardiac catheterisation by the Judkins technique as an outpatient procedure. *Br Med J* 1989;**298**:875–6.
7 Brown R, MacDonald A. Use of 5-French catheters for cardiac catheterisation and coronary angiography. *Cathet Cardiovasc Diagn* 1987;**13**:214–7.
8 Kohli RS, Vetrovec GW, Lewis SA, Cole S. Study of performance of 5 French and 7 French catheters in coronary angiography. *Cathet Cardiovasc Diagn* 1989;**18**: 131–5.
9 Mahrer PR, Eshoo N. Out-patient cardiac catheterization and coronary angiography. *Cathet Cardiovasc Diagn* 1981; 7:355–60.